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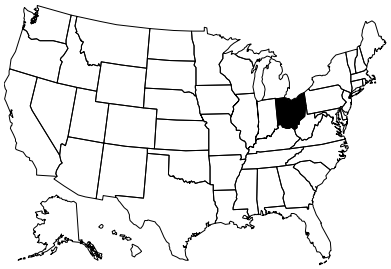

Contact Information

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OHEPA Division of Surface Water,Statewide Biological and Water Quality Monitoring and Assessment homepage: http://www.epa.state.oh.us/dsw/bioassess/ohstrat.html

Program Description

The Ohio EPA has been sampling biological communities in Ohio streams and rivers with standardized sampling protocols since the mid 1970s. Biological criteria was incorporated into the Ohio water quality standards (WQS; Ohio Administrative Code 3745-1) regulations in February 1990 (effective May 1990). These criteria consist of numeric values for the Index of Biotic Integrity (IBI) and Modified Index of Well-Being (MIwb), both of which are based on fish assemblage data, and the Invertebrate Community Index (ICI), which is based on macroinvertebrate assemblage data. Criteria for each index are specified for each of Ohio's five ecoregions (as described by Omernik 1987), and are further organized by organism group, index, site type, and aquatic life use designation. These criteria, along with the existing chemical and whole effluent toxicity evaluation methods and criteria, figure prominently in the monitoring and assessment of Ohio's surface water resources.

Ohio EPA employs biological, chemical, and physical monitoring and assessment techniques in biosurveys in order to meet three major objectives: 1) determine the extent to which use designations assigned in the Ohio WQS are either attained or not attained; 2) determine if use designations assigned to a given waterbody are appropriate and attainable; and 3) determine if any changes in key ambient biological, chemical, or physical indicators have taken place over time, particularly before and after the implementation of point source pollution controls or best management practices. Biosurvey data are processed, evaluated, and synthesized in a biological and water quality report. Each biological and water quality study contains a summary of major findings and recommendations for revisions to WQS, future monitoring needs, or other actions that may be needed to resolve existing impairment of designated uses. While the principal focus of a biosurvey is on the status of aquatic life uses, the status of other uses such as recreation and water supply, as well as human health concerns, are also addressed.

Documentation and Further Information

Year 2000 Ohio Water Resource Inventory, 305(b) Report: http://www.epa.state.oh.us/dsw/documents/Ohio305B2000.pdf

FWPCA Section 303(d) TMDL Priority List for FFY 1999-2000: http://www.epa.state.oh.us/dsw/tmdl/303dnotc.html

The State of the Aquatic Ecosystem: Ohio Rivers and Streams, 1998 Status: http://www.epa.state.oh.us/dsw/documents/fs8mas98.pdf

The Role of Biological Criteria in Water Quality Monitoring, Assessment, and Regulation, 1995: http://www.epa.state.oh.us/dsw/documents/instbusl.pdf

Using Biological Criteria to Validate Applications of Water Quality Criteria: Dissolved and Total Recoverable Metals, February 1997: http://www.epa.state.oh.us/dsw/documents/gli_bio.pdf

Rankin, E.T. 1989. *The qualitative habitat evaluation index (QHEI): rationale, methods, and application*. Division of Water Quality Planning & Assessment, Ecological Assessment Section, Columbus, Ohio.

Biological and Water Quality Reports, list of documents: http://www.epa.state.oh.us/dsw/document_index/psdindx.html

Biocriteria manuals are currently only available as hard copies upon emailed or written request. Information on obtaining copies can be found at http://www.epa.state.oh.us/dsw/document_index/printdoc.html. The biocriteria manuals are titled as follows:

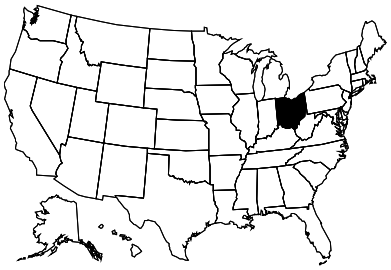
Ohio Environmental Protection Agency. 1987a. *Biological criteria for the protection of aquatic life: Volume I. The role of biological data in water quality assessment*. Division of Water Quality Monitoring & Assessment, Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1987b. *Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters*. Division of Water Quality Monitoring & Assessment, Surface Water Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1989b. *Addendum to Biological criteria for the protection of aquatic life: Volume II. Users manual for biological field assessment of Ohio surface waters*. Division of Water Quality Planning & Assessment, Ecological Assessment Section, Columbus, Ohio.

Ohio Environmental Protection Agency. 1989c. *Biological criteria for the protection of aquatic life: Volume III. Standardized biological field sampling and laboratory methods for assessing fish and macroinvertebrate communities*. Division of Water Quality Planning & Assessment, Ecological Assessment Section, Columbus, Ohio.

OHIO



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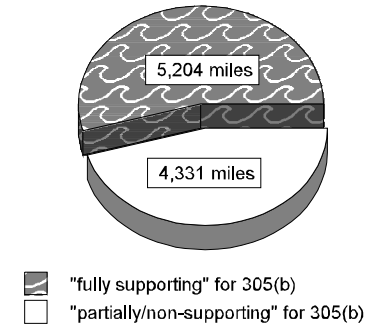
Programmatic Elements

Uses of bioassessment within overall water quality program	✓	problem identification (screening)
	✓	nonpoint source assessments
	✓	monitoring the effectiveness of BMPs
	✓	ALUS determinations/ambient monitoring
	✓	promulgated into state water quality standards as biocriteria
	✓	support of antidegradation
	✓	evaluation of discharge permit conditions
	✓	TMDL assessment and monitoring
		other:
Applicable monitoring designs	✓	targeted (i.e., sites selected for specific purpose) *(special projects, specific river basins or watersheds, and comprehensive use throughout jurisdiction)*
	✓	fixed station (i.e., water quality monitoring stations) *(specific river basins or watersheds)*
		probabilistic by stream order/catchment area
		probabilistic by ecoregion, or statewide
	✓	rotating basin *(special projects, specific river basins or watersheds, and comprehensive use throughout jurisdiction)*
	✓	other: geometric design *(specific river basins or watersheds and comprehensive use throughout jurisdiction)*

Stream Miles

Total miles *(based on the USEPA RF3 map of perennial stream miles as determined for Ohio)*	**29,113**
Total perennial miles	29,113
Total miles assessed for biology	**9,535**
fully supporting for 305(b)	5,204
partially/non-supporting for 305(b)	4,331
listed for 303(d)*	2,052
number of sites sampled *(1999-2000)*	1,100
number of miles assessed per site *(1999-2000)*	2.5

9,535 Miles Assessed for Biology



*The 2,052 miles are from Ohio's 1998 303(d) list, which is based on the 1996 305(b) statistics and includes data collected through 1994. OHEPA has recently taken a different approach to assessment and listing that will be reflected in upcoming 303(d) listings. The Agency now discourages the use of attainment statistics based on monitored stream miles in favor of a watershed level approach that provides an indication of the attainment status of watersheds in total (in essence, a measure of square miles of watersheds fully, partially, or not supporting ALU).

Aquatic Life Use (ALU) Designations and Decision-Making

ALU designation basis		Class System (A,B,C) - Tiered
ALU designations in state water quality standards		Seven designations: Warmwater Habitat, Exceptional Warmwater Habitat, Coldwater Habitat, Modified Warmwater Habitat, Seasonal Salmonid, Limited Warmwater Habitat (being phased out), Limited Resource Water
Narrative Biocriteria in WQS		Procedures used to support narrative biocriteria located in Ohio WQS, http://www.epa.state.oh.us/dsw/rules/3745-1.html
Numeric Biocriteria in WQS		Also found in Ohio WQS, see above link
Uses of bioassessment data in integrated assessments with other environmental data (e.g., toxicity testing and chemical specific criteria)	✓	assessment of aquatic resources
	✓	cause and effect determinations
	✓	permitted discharges
	✓	monitoring (e.g., improvements after mitigation)
	✓	watershed based management
Uses of bioassessment/ biocriteria in making management decisions regarding restoration of aquatic resources to a designated ALU		There are many instances where bioassessments documented before and after conditions based on POTW improvements. Biosurvey data and biocriteria thresholds are the primary arbiters in the determination of aquatic life use attainment status; results are used to determine 305(b) aquatic life use attainment statistics and to drive the 303(d) listing/delisting and TMDL development process.

Reference Site/Condition Development

Number of reference sites		**500 total** (including modified reference sites)
Reference site determinations		site-specific
		paired watersheds
	✓	regional (aggregate of sites)
		professional judgment
		other:
Reference site criteria*		Representative of best watershed conditions within an ecoregion given the background activities prevalent in society.
Characterization of reference sites within a regional context		historical conditions
	✓	least disturbed sites
		gradient response
		professional judgment
		other:
Stream stratification within regional reference conditions	✓	ecoregions (or some aggregate)
		elevation
		stream type
		multivariate grouping
		jurisdictional (i.e., statewide)
		other:
Additional information	✓	reference sites linked to ALU
	✓	reference sites/condition referenced in water quality standards *(listed in Biocriteria Manuals, which are referenced in WQS)*
	✓	some reference sites represent acceptable human-induced conditions

*All reference sites were originally screened to eliminate sites with evidence of substantial human disturbance. This was accomplished by examining maps of human population density and current and past land uses, compiling a watershed disturbance ranking, and noting the size and location of point source discharges. Additional site-specific factors considered in the selection of a reference site included (1) the amount, if any, of stream channel modification, (2) the condition of the vegetative riparian buffer zone, (3) water volume, (4) channel morphology characteristics, (5) substrate character and condition, (6) presence of obvious color/odor problems, (7) amount of instream woody debris, and (8) the general representativeness of the site within the ecoregion.

Field and Lab Methods

Assemblages assessed	✓	benthos *(100-500 samples/year; single season, multiple sites - broad coverage)*
	✓	fish *(100-500 samples/year; single season, multiple sites - broad coverage)*
		periphyton
		other:
Benthos		
sampling gear		collect by hand, multiplate: 200-400 micron mesh
habitat selection		multihabitat and artificial substrate
subsample size		entire sample (presort with subsampling)
taxonomy		combination (lowest practical with current knowledge)
Fish		
sampling gear		backpack electrofisher (in small streams only), boat electrofisher, pram unit (tote barge), and longline method using electrofishing unit and 100 meter line
habitat selection		multihabitat
sample processing		biomass - individual and batch, anomalies
subsample		batch (for weight only)
taxonomy		species
Habitat assessments		visual based; performed with bioassessments
Quality assurance program elements		standard operating procedures, quality assurance plan, periodic meetings and training for biologists, taxonomic proficiency checks, specimen archival, and a certification program for bioassessment has been developed for the OHEPA Voluntary Action Program (i.e., Brownfields Redevelopment)

Data Analysis and Interpretation

Data analysis tools and methods	✓	summary tables, illustrative graphs
		parametric ANOVAs
		multivariate analysis
	✓	biological metrics *(aggregate metrics into an index)*
		disturbance gradients
		other:
Multimetric thresholds		
transforming metrics into unitless scores		95th percentile of reference population
defining impairment in a multimetric index		25th percentile of reference population (ecoregion Warmwater Habitat and Modified Warmwater Habitat); 75th percentile of reference population (statewide Exceptional Warmwater Habitat); EPA RBP Guidelines
Evaluation of performance characteristics	✓	repeat sampling *(many sites - including reference sites - with multiple-year collections to track temporal variability)*
	✓	precision *(multiple samples occasionally collected from the same site on the same date, especially at potential litigation sites)*
	✓	sensitivity *(studies have been done to determine the possible range of variation in index scores at a given sampling location on a given sampling date)*
		bias
		accuracy
Biological data		
Storage		In initial stages of modernization and migration to MS Access
Retrieval and analysis		Custom programs to calculate indices, other summarized data, 305(b) statistics, etc.